Review of
The seismic hazard from the Lembang Fault, Indonesia,
derived from InSAR and GNSS data
by E. Hussain et al. (2023)

In this study, the authors estimate the slip and shallow creep rates of the Lembang fault, Indonesia, by means of radar interferometry and continuous GNSS time series analysis. The results are used to make a first order assessment of the seismic hazard posed by this fault to the population living in neighbouring areas. This assessment is based on the superposition of the size of the population distribution and the ground accelerations predicted by the Global Earthquake Model OpenQuake engine for two maximum magnitude earthquakes (full rupture of the fault), corresponding to the moment deficit accumulation derived from the resulting slip rate and the upper and lower limits of the return period of large earthquakes on the fault.

This is, thus, a study of a poorly understood fault which might have been overlooked because it hasn't had any recorded historical seismic activity. However, previous paleoseismology studies indicate large crustal earthquakes have been produced at this fault, with return periods longer than a century, and the present work confirms strain accumulation is occurring at the fault at rates that make it capable of producing shallow earthquakes with magnitudes larger than 6.5, at a fault embedded in a densely populated area. These are important results, not only to better understand the fault behaviour and to contribute to hazard assessment, but also to inform urban planning and risk for the nearby populations.

The manuscript is very well written and has very nice figures that illustrate and support the main text. It is my opinion that the manuscript is almost ready for publication. However, I noted a few places where the discussion could be refined in order to improve its clarity. I list these points in the comments below.

Main comments:

1. In the beginning of the manuscript, the authors state that "The fault dips to the north by about 75 degrees" (line 24). Why is a "constant fault dip of 60º" (line 125) used to estimate the area of the fault and the ground motion fields (line 132)? Also, when estimating the ground motion fields, the fault is modeled as two fault planes that "dip at 60° *to the south*" (line 132). Why the different orientation?
2. In the manuscript it is assumed that the motion at the fault plane is exclusively left-lateral strike-slip. Is there no evidence at all of dip-slip motion? Do the SAR and GNSS observations confirm this?
3. In figures 3a, b, c, the strong signal attributed to subsidence due to groundwater extraction obscures the signal due to interseismic deformation, which is the target of this study. Perhaps a change in the limits of the color scale could help enhance (at least in Figure 3c) the velocity gradient at the fault (if any), in order to confirm the assumption of no dip-slip rate accumulation.

This could be done on a separate panel or an inset showing only the area of interest. A figure with profile A-A’ showing a negligible vertical gradient could also help.

4. Figure 3d could also benefit from a change in the color scale to enhance the horizontal velocity gradient across the fault, which is almost invisible with the current scale.
5. How is the Hussain et al. (2016) 1-D screw dislocation model affected by the introduction of a dipping fault instead of a vertical fault? Is it negligible so that it is justified to use a model that assumes a vertical fault even when the actual fault it is dipping? Is it negligible because of the assumption that the fault has no dip-slip?
6. How are the GNSS velocities used in the modeling? It is not clear to me what is the contribution of this data set to the results. Were they jointly inverted with the InSAR data? If so, how were they weighted?
7. What is the shallow surface creep depth (d_2) found for the maximum likelihood solution (lines 109-110)?
8. From a quick look at the data only, it is very hard to tell if the velocity gradient is only due to fault locking or if there is a creep component in the motion (Figure 5). Do models assuming shallow creep perform better than those that assume no creep? Was this tested? If not, is there any other evidence in favor of shallow creep that justifies ignoring a case with no creep? Does the peak at 0 km for creep depth in Figure 6 (lines 199-200) favors the consideration of models with no shallow creep at all?
9. How is the result of a shallow surface creep rate of 2.2 mm/yr accounted for in the estimate of the moment deficit on this fault? It appears as it is ignored and the estimated slip rate is imposed to the whole fault. Wouldn’t this overestimate the moment deficit?
10. Another possible overestimation of the moment deficit can be attributed to the locking depth, which is assumed to be at the bottom of the estimated seismogeinc zone, based on microseismicity relocation, but is shallower based on the modeling on this work. This is more or less discussed in section 6.1 of the manuscript, but I wonder if estimates of end-member moment deficits associated with the relevant bounds of the estimated locking depth (and accounting for shallow creep, if possible), could help bracket the range of earthquake magnitudes that could be expected at the fault, and explore those scenarios as well. Would this be possible and would it provide useful information to improve the discussion?
11. Could the discrepancy between the geological and geodetic slip rates be due to temporal variations of the slip rate (lines 182-184)?
12. How is the potential magnitude of a combined Padalarang-Lembang rupture estimated? Were the assumed slip rates, seismogenic zone depths, and return periods the same for both faults (those estimated for the Lembang fault in this work)?

Minor corrections:

13. Line 18: “recent history” might be more accurate that “recent memory”.
14. Line 25: Is the Lembang basing the same as the Bandung basin? If not, please consider locating it on the map in Figure 1.
15. Line 79: “existing GNSS stations”, is it station?

16. Lines 90-91: “The velocity for each GNSS station at mm level.” Incomplete sentence, it probably was supposed to be part of the sentence before it.
17. Line 94: “5 km either…” Is it “5 km on either…”
18. Figure 7: the units of the Vs30 values are missing. Consider changing the label vs30_clipped to vs30.
19. Line 145: Figure 9 is mentioned in the main text before any mentions of Figure 8. Consider reordering the figures, although I perfectly understand why Figure 9 appears later.
20. Line 169: Figure 9 should be referenced here.
21. Line 211: “to jump larger across larger segment…”, change to “to jump across larger segment…”
22. Line 215: “if the faults are late in its earthquake cycle”, change to “if the faults are late in their earthquake cycle”.
23. Line 245: “Sentinel-1¨ appears twice.